R. T. HICKS CONSULTANTS, LTD.

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December 27, 2017

Olivia Yu
NMOCD District 1
1625 N. French Dr.
Hobbs, NM 88240

RE: Operator: Pride Energy Company
NM 87 State #001 (Tank Battery)
API#: 30-025-23655
Section 33-14S-34E: Unit K
Lea County, New Mexico
January 11, 2017 Battery Release, Horizontal and Vertical Characterization Plan
1RP-4625

Dear Ms. Yu:

Hicks Consultants is pleased to submit this proposal on behalf of Pride Energy Company to define the horizontal and vertical extent of the above-referenced 2017 release. The release was predominantly crude oil and occurred at the tank battery, which is located at the production pad for the plugged NM 83 State #1 SWD well (Latitude: 33.05973, Latitude: -103.514153; 33-14S-34E Unit Letter J), about 1325 feet east of the NM 87 State #001 producing well (Figure 1). Figure 1 also shows the elevation of groundwater. Given the 4,115 elevation of the site and a groundwater elevation of about 4,045; the depth to water at the site is approximately (4115-4045=) 70 feet.

The primary purpose of this plan is to quantify hydrocarbon and chloride concentrations within the footprint of the 2017 release sufficiently to develop a corrective action, should one be necessary. The secondary purpose is to collect data relating to historical release(s) from the former SWD (prior to Pride Energy operation) to determine if "a release … of oil or other water contaminant, in such quantity as may with reasonable probability be detrimental to water or exceed the standards in Subsections A and B or C of 19.15.30.9 NMAC."[1] Pride Energy understands that additional actions may be necessary to supplement the data collected by the program outlined below.

The following actions will be implemented during a 10- hour field day in mid-January 2018. When the schedule is finalized, we will notify OCD and the SLO of the field program at least 48 hours in advance. We believe all of the work elements can be achieved during the time allotted. However, the Project Geologist will eliminate the least important work (trench sampling of the historic release) to achieve the goals within the 1-day program.

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[1] NMAC 19.15.29.8.B

1. Prepare a health and safety plan for the proposed actions as well as a detailed sampling and analysis Standard Operating Procedures (SOPs) for submission to OCD and SLO prior to the field program.
2. Based upon
    - physical evidence of the release on the ground,
    - discussions with the pumper,
    - review of a 2017 aerial photo showing the release, and
    - locating the sampling trench from the July 2017 (see attached analyses) sampling

    we will modify the proposed trench sampling locations as necessary. We will use a backhoe capable of excavating to at least 12 feet to collect samples at 2-foot intervals from the surface to total depth. Total depth will be determined by the backhoe bucket extent (~12ft) or if the backhoe bucket cannot penetrate a hard caliche layer, whichever is less. Samples will be collected at locations 10-15 feet from north, south, east and west boundaries. The south boundary proposed location is located outside of the tank battery containment wall. Soil samples from each trench will be titrated in the field for chloride concentrations. At least two samples from each trench will be submitted to the laboratory as discussed in item #5, below. Figure 2 shows the proposed trench locations relative to the release captured in a 2017 aerial photograph.
3. To characterize the historic release that occurred prior to operation of the battery by Pride Energy, we will use the same protocol as outlined in #2 (above) and collect samples at the four locations shown in Figure 3. Examination of aerial photographs indicates that the "historic release" occurred sometime between 1996 and 2003. Pride Energy took ownership of the New Mexico 83 State SWD #001 in February 2007. Per request of the State Land Office, one additional trench sample will be collected within the depression ("playa") northwest of the tank battery.
4. A review of aerial photographs showing the 2017 and historic releases, analytical data from a July 2017 trench sampling event, and locating the July 2017 trench sampling location during a December 5, 2017 site visit; we elect to install one borehole that will vertically characterize the 2017 and historic releases. The borehole location is shown on Figures 2 & 3. Total depth of the borehole will be approximately 56-feet or contact with ground water, whichever is less. Split spoon samples will be collected every 5-feet from 1-foot to 26-feet below ground surface. From 26 ft to total depth, split spoon samples will be collected every 10-feet. Soil samples from each split spoon sample will be titrated in the field for chloride concentrations. At least two samples from the borehole will be submitted to the laboratory as discussed in item #5, below
5. At least two samples from each of the 9 trench locations and the one borehole location showing high chloride titration concentrations and/or showing physical impairment (visual/olfactory) will be submitted to a laboratory for analysis of chloride (Method 300.1), DRO+DRO+MRO extended range (Method 8015M), and BTEX (Method 8260).

We will submit the results of the 1-day field program to OCD and SLO with recommendations for the next step, which could be closure of the regulatory file. Please contact Andrew Parker at 970-570-9535 (andrew@rthicksconsult.com) if you have any questions concerning the mid-January 2018 field event.

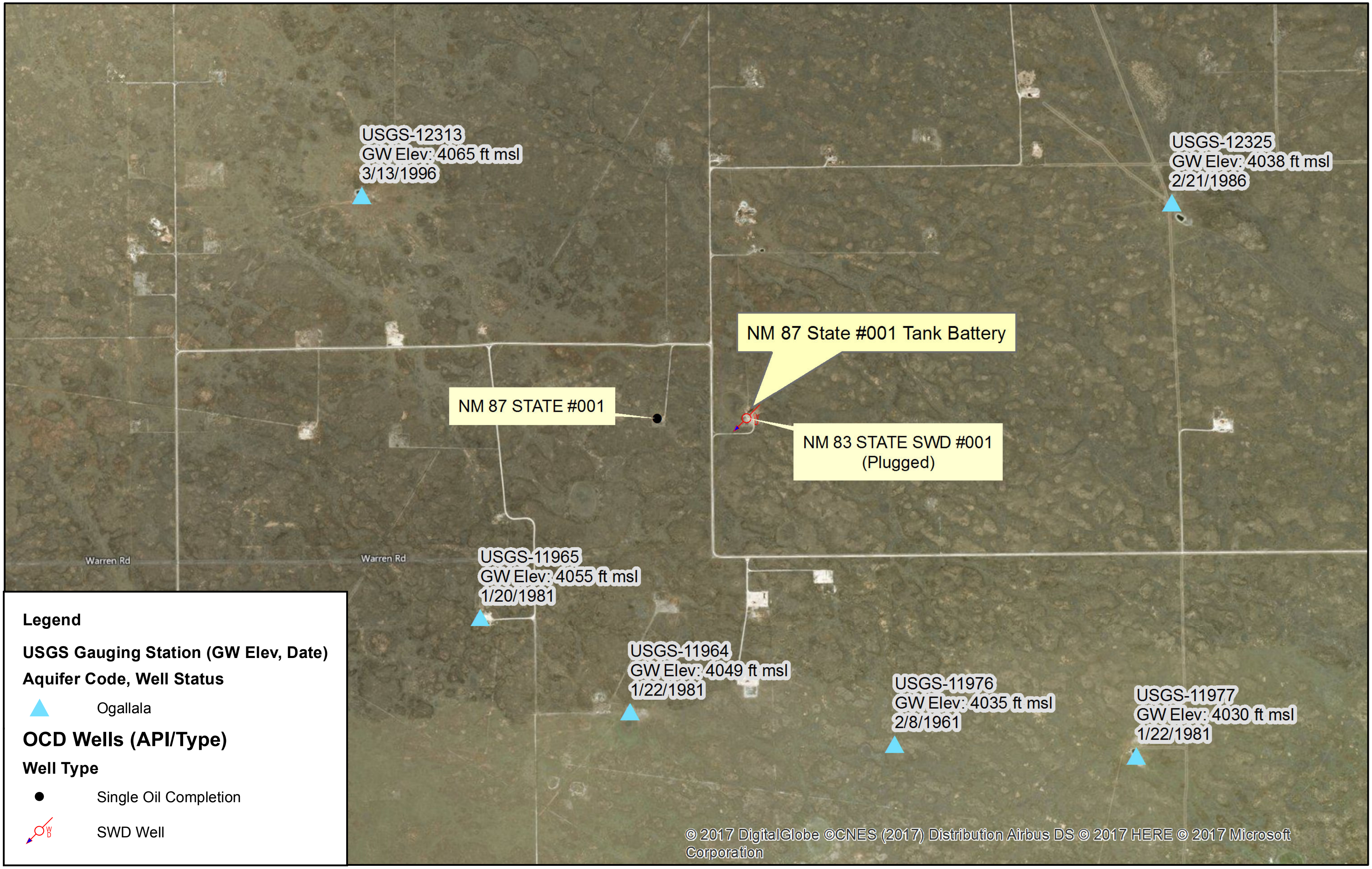
Sincerely,
R.T. Hicks Consultants, Ltd.

Andrew Parker

Andrew Parker
Env. Project Manager

Copy: Pride Energy
State Land Office, Ed Martin, Amber Groves

M:\Pride Energy\NM 87 State 001 Tank Battery 1RP_4625\Figures for preliminary investigation Dec 2017\Figure 1 - location.mxd



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Ground Water Elevation Relative to Pride Energy Wells

Figure 1

Pride Energy
NM 87 State #001 Tank Battery

December 2017

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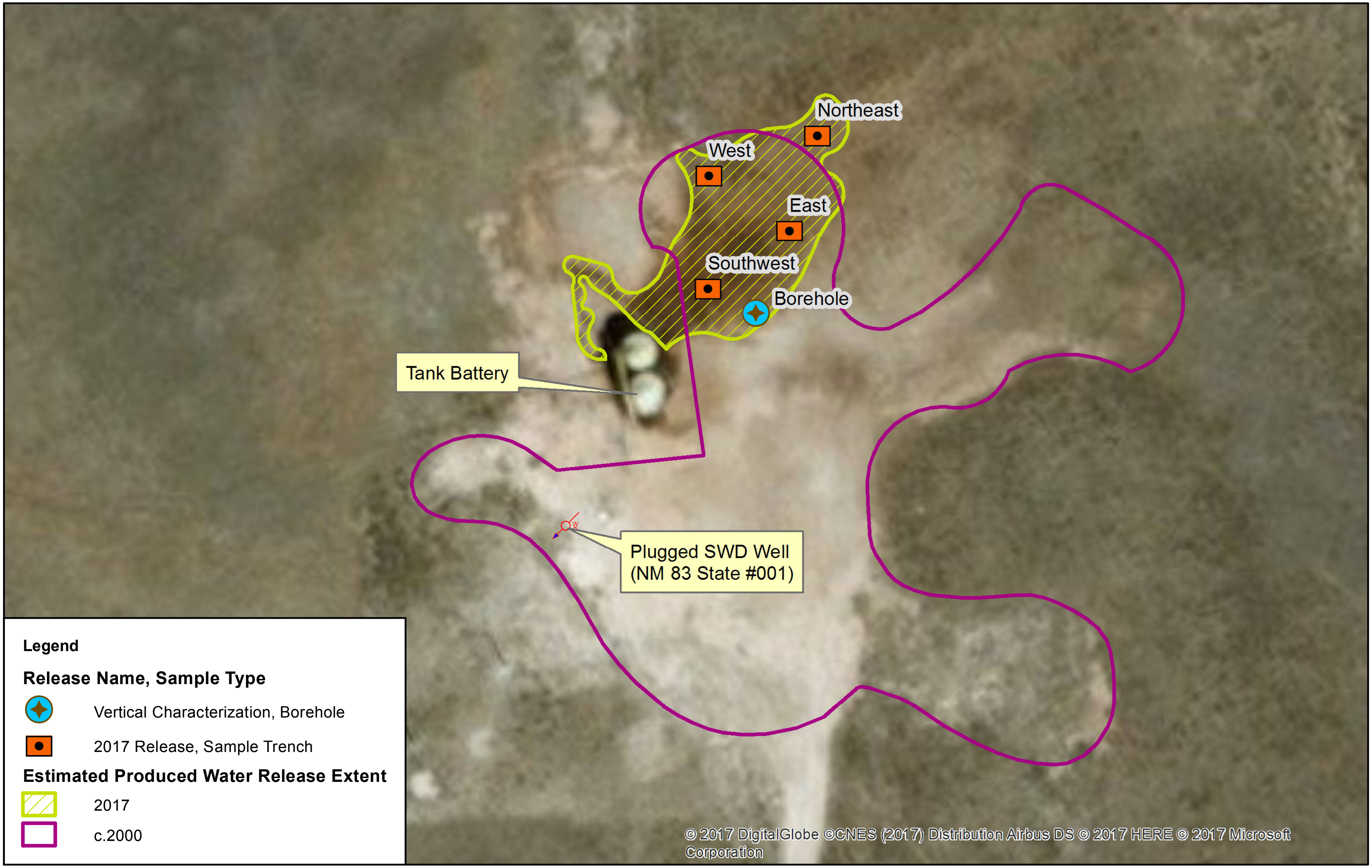

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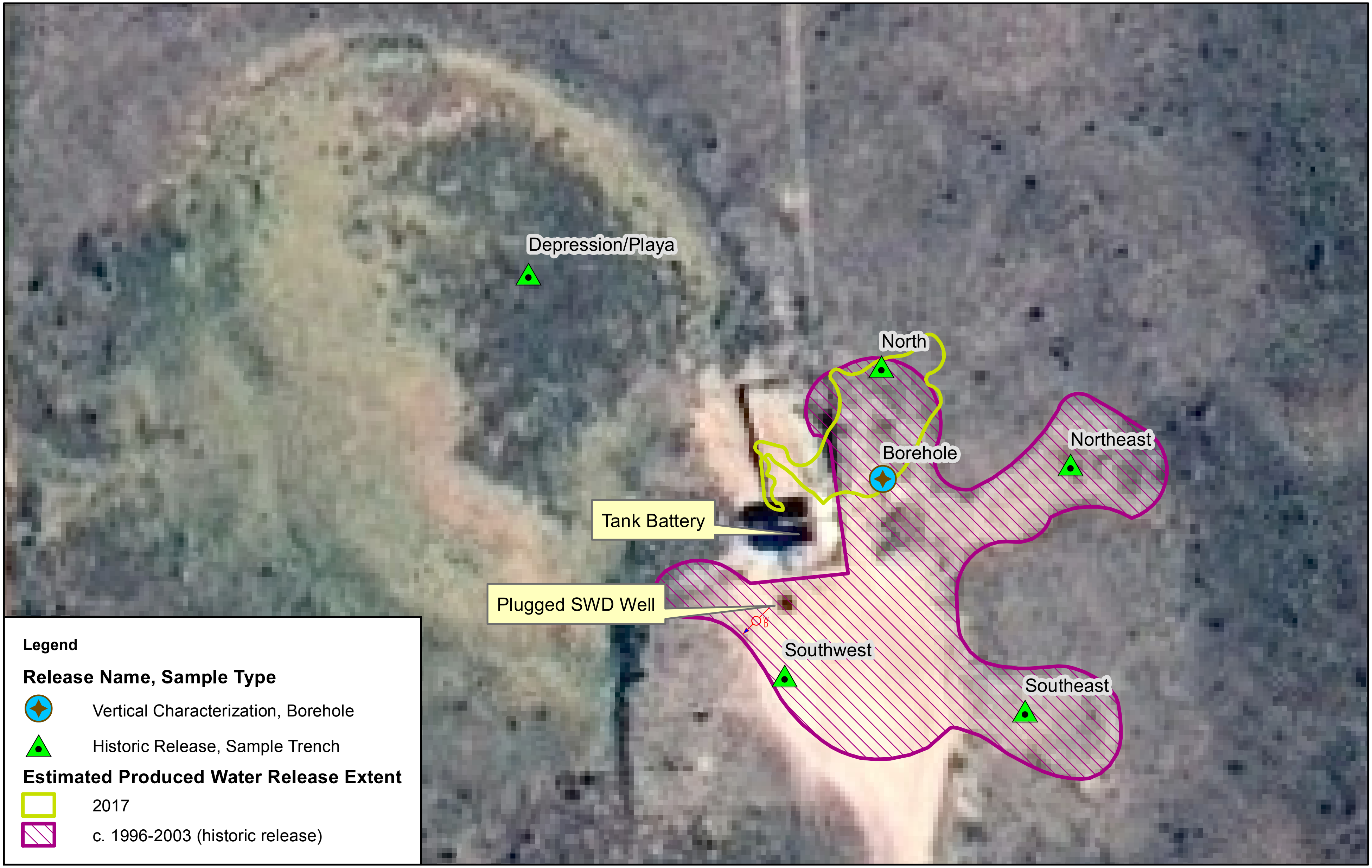
Sample Locations - 2017 Release	Figure 2
Pride Energy NM 87 State #001 (Tank Battery)	December 2017

M:\Pride Energy\NM 87 State 001 Tank Battery 1RP_4625\Figures for preliminary investigation Dec 2017\Figure 3 - historic trench locations.mxd



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Sample Trench Locations - Historic Release

Figure 3

Pride Energy
NM 87 State #001 (Tank Battery)

December 2017

Standard Operating Procedures

- Soil Trench Sampling
- Chloride Titration

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September 3, 2017

Standard Operating Procedure for Soil Sampling from Test Pits

This document describes the procedures to be used when collecting soil samples using an excavator for the purpose of laboratory analysis. The reader should be familiar with relevant sections of the following document as it is the source of this field method:

> Soil Sampling, SESDPROC-300-R3, USEPA, August 2014
> https://www.epa.gov/quality/soil-sampling

The trenches created by a backhoe or excavator offer the capability of collecting samples from specific intervals and allow visual correlation with vertically and horizontally adjacent material. No sample will be collected by entering a trench deeper than 4 feet.

Data Quality Objectives and Quality Assurance protocols in the sampling plan must be followed. This method must be modified if concentrations of VOCs (e.g. benzene) are expected to be less than 0.2 mg/kg.

This SOP shall be submitted to the excavation contractor at least two work days prior to the scheduled date of sampling.

Field Method to Collect Samples from Excavator Bucket

1. This SOP is appended to the Health and Safety Plan associated with the field program.
2. Documentation of all sampling is required. Documentation includes, at a minimum
    a. Photographs of each sample with location stamp on the image or within the electronic file of the photograph
    b. Written notes in a field notebook that
        i. Describe the sample in terms of texture, grain size, odor, moisture, color, etc.
        ii. Correlate the name of the sample with location[1], depth, photograph number, date and time of sampling
        iii. Describe any anomalies of sampling (e.g. excessive slough)
        iv. Provide other useful information (e.g. split samples with others)
    c. Chain of Custody forms tied to information in the field notebook
3. Inspect the backhoe or excavator to ensure the bucket is clean and free of grease or visual contamination. The intent of this sampling method is to avoid the need to decontaminate the bucket between sampling events.

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[1] The name of the sample can be a location from a fixed point, such as 120N/30E. The fixed point should be well head, telephone pole, corner of a foundation or other feature that can be easily identified in the field and on a Google Earth image. Latitude and longitude are generally not adequate for sample locations as the accuracy of hand-held GPS can be plus/minus 20 feet. A cemented benchmark may be installed at the site if multiple sampling events are anticipated.

4. Trenches for samples should proceed from the expected cleanest locations to the most impacted locations.
5. Place pre-labeled jars for the expected samples from the trench in a clean sample preparation area covered by a disposable drop cloth, inside the original container box, inside a zip-lock bag, or another secure and suitable protected location.
6. In general, samples should be obtained directly from the bucket in the following manner
    a. Excavate the sampling trench to form two benches:
        i. The upper bench is 0.5-1 foot above the proposed depth of sampling
        ii. The lower bench is 1-2 feet below the upper bench and more distant from the equipment and will capture slough from the excavation and allow the operator to cut into the soil at the upper bench with greater accuracy
    b. Cause the operator to clean slough from the upper bench and expose the earth material slightly above the desired sampling depth. Direct the operator with hand signals as necessary.
    c. Direct the operator to remove a 0.5-1 foot layer of earth from the upper bench into the bucket and then to the ground surface
    d. Examine the earth in the bucket and
        i. Remove any slough and any smear from the bucket with a clean (decontaminated) trowel or knife to expose relatively undisturbed material
        ii. Obtain samples of undisturbed material for VOCs (e.g. BTEX) first and non-volatile constituents in a separate container next[2]
        iii. Do not obtain samples from within 1-inch of the bucket surface
        iv. Label sample jars for depth and location then place in a cooler on ice in a separate zip-lock bag for each sample suite
        v. Describe the material in the bucket with respect to grain size, color, odor, texture, etc.
        vi. Obtain a reasonable close-up photograph of the material
    e. Inspect the bucket to cause cleaning or decontamination as required to satisfy data quality objectives.
    f. Dispose of the drop cloth, spilled material or other debris and recondition the sample preparation area with a clean drop cloth and the next set of labeled sample jars.
    g. Repeat steps a-f for the next sampling depth

Some precision with respect to actual depth of the sample may be reduced with this method but if the soil to be sampled is uniquely distinguishable from the

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[2] See preservation, container material and sample size requirements on the accompanying chart. The earth material must be packed into a single 2-oz. glass container with a screw cap and septum seal. The sample container must be filled quickly and completely to eliminate head space.

adjacent or nearby soils, it is possible to adequately characterize the material as to location and depth.

If sampling for low concentrations of VOC (i.e. <0.2 mg/kg of benzene) special sampling containers, samplers and protocols are required.

Equipment Checklist

- Site-specific plans (e.g, Health and Safety and Sampling Plan)
- Plastic zip-top bags to hold samples in cooler
- Field logbook
- Personal protective clothing (see HASP)
- Indelible black ink pens and markers
- Plastic sheeting as drop cloth for sample preparation area and other uses
- Clear, waterproof tape to cover sample labels
- Disposable nitrile or appropriate gloves
- Appropriate sample containers with labels
- Bags of ice
- Decontamination supplies: three buckets, “simple green” soap, Alconox or equivalent, fresh water, distilled water
- Chain of custody forms
- Wipes or paper towels
- Insulated cooler(s)
- Global Positioning System (GPS) unit (iPhone may be acceptable)
- >20-ft measuing tape
- Trash Bags
- Spoons and/or knives that can be completely decontaminated
- Monitoring/screening instruments as required by the health and safety plan

FIELD PROCEDURE
Chloride Titration Using
0.282 Normal Silver Nitrate Solution

1.0 Purpose

This procedure is to be used to determine the concentration of chloride in soil and other solids (e.g. drilling waste).

2.0 Scope

This procedure is to be used as the standard field measurement for soil chloride concentrations.

3.0 Sample Collection and Preparation

3.1 Collect at least 80 grams of soil from the sample collection point. Take care to ensure that the sample is representative of the general area of concern to include visible concentrations of hydrocarbons and soil types. If necessary, prepare a composite sample for soils obtained at several points in the sample area.

3.2 The soil sample(s) shall be immediately inserted into a one-quart or larger polyethylene freezer bag. Care should be taken to insure that no cross-contamination occurs between the soil sample and the collection tools or sample processing equipment.

3.3 The sealed sample bag should be massaged to break up any clods.

4.0 Sample Preparation

4.1 Tare a clean glass vial having a <u>minimum</u> 40 ml capacity. Add at least 10 grams of the soil sample and record the weight.

4.2 Add at least 10 grams of reverse osmosis water or distilled water to the soil sample and shake or agitate for 20 seconds.

4.3 Allow the sample to set for a period of 5 minutes or until the separation of soil and water.

4.4 Carefully pour the free liquid extract from the sample, through a paper filter if necessary, into a clean plastic cup.

5.0 Titration Procedure

5.1 Using a graduated pipette, remove 10 ml extract and dispense into a clean plastic cup.

5.2 Add 2-3 drops potassium chromate (K_2CrO_4) to mixture.

5.3 If the sample contains any sulfides (hydrogen or iron sulfides are common to oilfield soil samples) add 2-3 drops of hydrogen peroxide (H_2O_2) to mixture.

5.4 Using a 1 ml pipette, carefully add .282 normal silver nitrate (one drop at a time) to the sample while constantly agitating it. Stop adding silver nitrate when the solution begins to change from yellow to red. Be consistent with endpoint recognition.

5.5 Record the ml of silver nitrate used.

6.0 Calculation

To obtain the chloride concentration, insert measured data into the following formula:

$$\frac{.282 \text{ X } 35{,}450 \text{ X ml } AgNO_3}{\text{ml water extract}} \quad \text{X} \quad \frac{\text{grams of water in mixture}}{\text{grams of soil in mixture}}$$

Using Step 5.0, determine the chloride concentration of the RO water used to mix with the soil sample. Record this concentration and subtract it from the formula results to find the net chloride in the soil sample.

Record all results on a field form.

Additional Notes

1) Make sure the scale is weighing in grams.
2) “Zero” the scale with clean, empty 40 ml container (including the cap) sitting on the scale.
3) Add 10 to 20 grams of sample soil to the container. Record the weight.
4) “Re-zero” the scale.
5) Add distilled water to almost fill the container. Record the weight.
6) Screw the cap on, and shake the container to thoroughly mix the sample with the distilled water. Set aside to allow settling of the sample. This will take only a few minutes for coarse grained material and up to 20 minutes for very fine grained sediments. The solution does not need to be perfectly clear to continue the procedure.
7) Add 3 drops of Potassium Chromate to a small, clean, plastic cup.
8) Extract 10 ml (using a large pipette – at least 10 ml) of solution from the sample container and put it into the plastic cup. Record ml of solution placed in the cup.
    a. This can be kept track of by careful recording of “before” and “after” fluid levels in the pipette.
    b. Or: Place the plastic cup on the scale with the potassium chromate and “zero” the scale. Add solution to the cup until 10 grams is indicated on the scale.
9) Swirl the solution and the potassium chromate to mix them.
10) Using a 1 ml pipette, add silver nitrate to the mixed solution drop by drop while swirling. The entire solution will change from a pale lemon yellow color to a brick red color when sufficient silver nitrate has been added. STOP when it all turns brick red. It does not need to be a deep brick red color. This will result in an overly high result. Record ml of silver nitrate used.
11) The chloride concentration of the sample is given by:

$$C_{sam} = (35{,}450 * 0.282) * \frac{\text{(grams of water)}}{\text{(grams of soil)}} * \frac{\text{(ml of silver nitrate)}}{\text{(ml of solution)}}$$

or:

$$C_{sam} = (9997) * \frac{\text{(grams of water (Step 5))}}{\text{(grams of soil (Step 3))}} * \frac{\text{(ml of silver nitrate (Step 10))}}{\text{(ml of solution (Step 8))}}$$

Units are: mg(of chloride)/kg(of soil)

Equipment List:

Scale
10 ml pipettes
1 ml pipettes
Controllers for pipettes (small and large),
  press pipette into open end (carefully)
40 ml sample containers
Small plastic cups
Silver Nitrate
Potassium Chromate
Distilled water
Waste container for final solution. A robust plastic jug with lid will do for field use.
  DO NOT pour this down a drain. Dispose of with a chemical lab.
Waste bags for used plastic cups (rinse and pour rinsing fluid into robust jug)

Calculator
Nitrile gloves
Safety glasses
Paper towels

Safety Data

http://ptcl.chem.ox.ac.uk/~hmc/hsci/chemicals/silver_nitrate.html

http://ptcl.chem.ox.ac.uk/~hmc/hsci/chemicals/potassium_chromate.html